

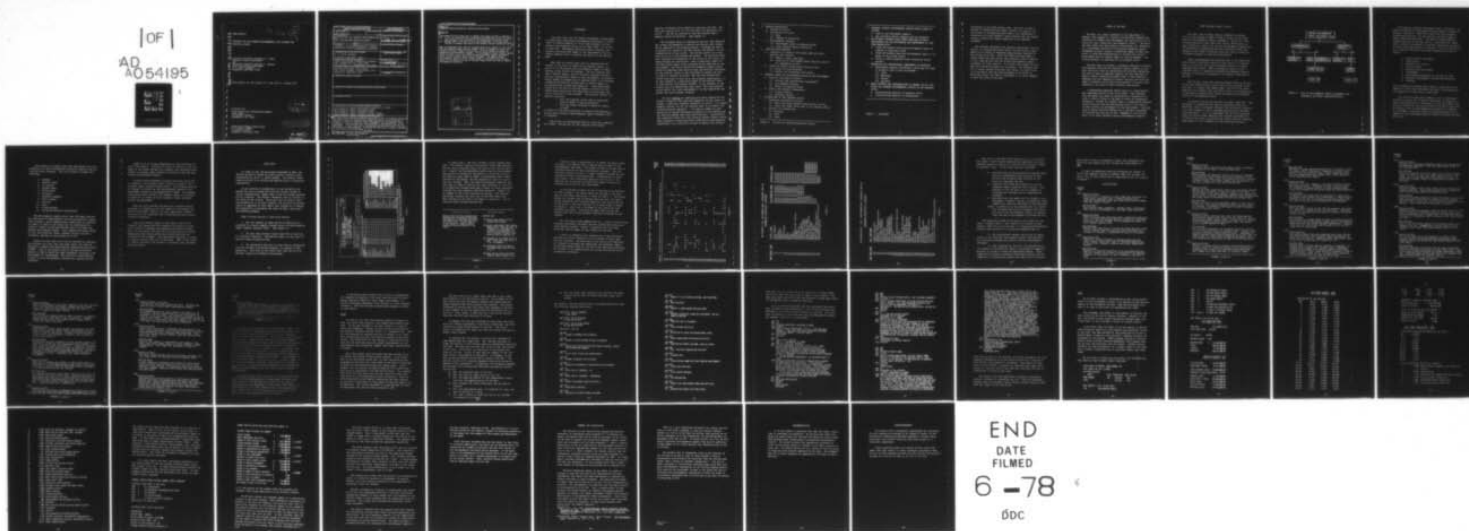
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BRIDGING THE GAP BETWEEN ENVIRONMENTAL DATA SYSTEMS AND POTENTI--ETC(U)
MAR 77 F A SKOVE, C L COCHRAN

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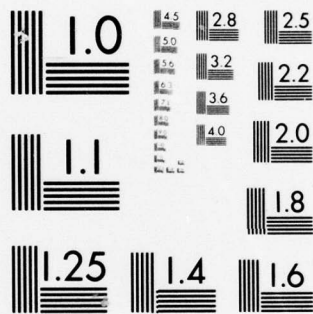
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BRIDGING THE GAP BETWEEN ENVIRONMENTAL DATA SYSTEMS AND
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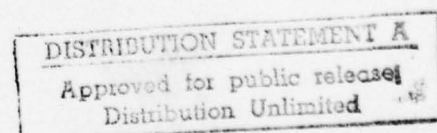
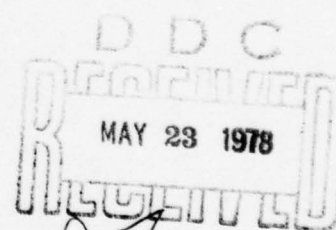
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Final Report for the Period of 1 July 1976 to 1 March 1977

Prepared for:

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Alexandria, VA 22332

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Annapolis, Maryland 21402



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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Construction Engineering Research Laboratory (CERL) in Champaign-Urbana has developed a series of computerized programs designed to assist personnel involved in writing Environmental Impact Assessments and Environmental Impact Statements. These programs have been developed at considerable cost to the government. It would seem that a considerable savings would result from full utilization of these programs. At present the Navy has no systematic approach to the writing of EIAs and EISes. (over)		

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Block 19:**Computer-Aided Environmental Legislative Data System****Block 20:**

The purpose of this project was to examine the systems at CERL to determine:

- (a) if the utilization of their programs by the Navy might result in significant savings in time and money in the preparation of EIAs and EISes; *and*
- (b) whether these files could be utilized by personnel at various levels in the Navy or whether they would be too esoteric for most potential users. *N*

CERL has developed three specific programs which were examined in this study. The Environmental Impact Forecast System (EIFS) is designed to assess the economic and social impact of construction, mission change, training, and operations and maintenance programs. The Environmental Impact Computer System (EICS) provides a basis for identifying environmental impacts and suggests means by which harmful impacts may be mitigated. The Computer-Aided Environmental Legislative Data System (CELDS) is designed to provide easy access to the abstracts of key or relevant federal and state laws as regards environmental protection.

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BACKGROUND

The legal basis for the federal government's enforcement of regulations concerning environmental protection as it pertains to federal agencies is to be found primarily in the National Environmental Policy Act of 1969 (NEPA - PL 91-190; 83 Stat 852). Subsequent Executive Orders, statutes, and judicial decisions have added to the requirements that all federal agencies work to enhance the quality of the environment.

When NEPA was passed there were no standardized procedures in the Navy, or indeed in any federal agency, to assist it in determining the environmental impact of implementing a wide variety of programs. The Act requires that when a federal agency, such as the Navy, proposes activity that may significantly impact on the environment, an environmental impact assessment may be required (EIA), or at minimum a Negative Declaration stating that no adverse impact is anticipated must be made and supported. The proper preparation of an EIA may be required before a project will be funded which underscores the importance of an accurate and timely submission of the document. The EIA must address two specific questions:

1. Will the proposed action have a significant adverse effect on the environment?
2. Will the effect referred to above be controversial?

If either of the above questions is answered affirmatively, a fuller report called an Environmental Impact Statement (EIS) is required.

The Council on Environmental Quality (CEQ) was established by NEPA. Section 102 (2) (B) requires that federal

agencies coordinate their method of reporting with CEQ. The very next section (102 (2) (C)) discusses the guidelines for an EIS. The EIS as required by the CEQ requires that a general outline be followed. (see Figure 1.)

The statement which is required by the act, must describe the current environmental situation and project what changes can be expected by the proposed action. Although the topics in general are stated in the CEQ outline, the details are the responsibility of the writer. The outline itself is so general as to be of only minimal assistance. The questions which must constantly be addressed, as the writer of the report proceeds through the outline, are: Does a particular aspect of the CEQ outline apply to his proposed action impacting on the environment? Are there adverse environmental impacts which should be addressed that have not been specifically identified by the outline? Where is the individual to garner the data in order to respond correctly? Has the data already been stored some place or must he be the original investigator? If he does respond to a particular point in the outline, where is the data for the response stored? Is his proposal in compliance with all federal and state laws? Will the proposed action affect the local environment or in any significant way modify the local economic balance?

The very process of complying with these regulations has become, because of the scope and complexity of the issues involved, a difficult technical operation in itself. For example, example, Section 102 (2) (A) requires that "a systematic and interdisciplinary approach ..." be used to effect an integrated use of social and natural sciences in the planning and the decision making concerning these projects. Nevertheless, the statements which deal with recently defined subject matter, about geographic areas previously unaffected by environmental regulations, will usually be written by people only recently

-
1. PROJECT DESCRIPTION
 - a. Purpose of action
 - b. Description of action
 - (1) Name
 - (2) Summary of activities
 - c. Environmental setting
 - (1) Environment prior to proposed action
 - (2) Other related Federal activities
 2. LAND-USE RELATIONSHIPS
 - a. Conformity or conflict with other land-use plans, policies and controls
 - (1) Federal, state, and local
 - (2) Clean Air Act and Federal Water Pollution Control Act Amendments of 1972
 - b. Conflicts and/or inconsistent land-use plans
 - (1) Extent of reconciliation
 - (2) Reasons for proceeding with action
 3. PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT
 - a. Positive and negative effects
 - (1) National and international environment
 - (2) Environmental factors
 - (3) Impact of proposed action
 - b. Direct and indirect consequences
 - (1) Primary effects
 - (2) Secondary effects
 4. ALTERNATIVES TO THE PROPOSED ACTION
 - a. Reasonable alternative actions
 - (1) Those that might enhance environmental quality
 - (2) Those that might avoid some or all adverse effects
 - b. Analysis of alternatives
 - (1) Benefits
 - (2) Costs
 - (3) Risks
-

Figure 1. Outline for CEQ-Prescribed EIS Content.

-
5. PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED
 - a. Adverse and unavoidable impacts
 - b. How avoidable adverse impacts will be mitigated
 6. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY
 - a. Trade-off between short-term environmental gains at expense of long-term losses
 - b. Trade-off between long-term environmental gains at expense of short-term losses
 - c. Extent to which proposed action forecloses future options
 7. REVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES
 - a. Unavoidable impacts irreversibly curtailing the range of potential uses of the environment
 - (1) Labor
 - (2) Materials
 - (3) Natural
 - (4) Cultural
 8. OTHER INTERESTS AND CONSIDERATIONS OF FEDERAL POLICY THAT OFFSET THE ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION
 - a. Countervailing benefits of proposed action
 - b. Countervailing benefits of alternatives
-

Figure 1. continued

introduced to the broad subject area. Not only is there a problem in determining the proper content of a report, but the process of determining which topics are significant or essential can itself present a major obstacle for the installation's initial and timely submission of an adequate statement.

The national government has invested significant time and capital in creating data bases which, on the surface, would appear to be useful in answering many problems inherent in the writing of an EIS. Since the effort has been made to create these data base tools, they should be used if they do in fact simplify the task of writing environmental impact statements or other reports. It is with this thought in mind that this research project was initiated. The intention was not to create another data base, but rather, to find if one is in existence that has been developed to the level of operating status, and then to determine if it can be adapted to meet the needs of the Navy.

NEEDS OF THE NAVY

The Navy, as a major component of the Department of Defense, must engage in a variety of activities ranging from training, to research and development and construction all of which will have significant environmental impacts. Therefore, the Navy finds that when Negative Declarations are inadequate it is inevitably involved in writing Environmental Impact Statements and must expend a significant number of man hours prior to receiving authorization to initiate any project which might have an adverse impact on the environment. The word environment is used here in its broadest sense.

The Navy needs to develop a systematic approach to analyze environmental data and the potential adverse impacts of certain activities that are associated with military operations. The lack of such an approach requires far more man hours by highly trained technical personnel than is cost effective. Reducing the time required to analyze the data and write the impact statements would allow the personnel to be more fully employed in the area of their technical specialties.

A standardized approach should result in a high quality and comprehensive EIS in the first effort, thus reducing time and money lost when an installation is required to re-write a report filling in the gaps or areas not adequately addressed. Through its regular usage, a standardized approach should sensitize the decision-making levels of the Navy as to what actions are detrimental to the environment. This may lead to better decision making with a realistic assessment of alternatives that may be less damaging to the environment, or at least minimize adverse environmental impacts.

ARMY PROGRAMS (CERL'S effort)

The Army, like the Navy, had no systematic procedure prior to the passage of NEPA in 1969 to assist in the preparation of environmental impact statements. Within two years the Army determined that there were serious deficiencies in their efforts to comply with the new environmental regulations. The Construction Engineering Research Laboratory (CERL) was charged by the Corps of Engineers with the task of proposing a research program to alleviate deficiencies.

Under the guidelines set forth by CEQ, it was hoped that most projects would only require an EIA, which is a document that is not, for the most part, circulated outside the agency proposing the project. When the proposal contains items that may result in significant adverse environmental impacts, however, an EIS must be prepared to be formally submitted to the CEQ.

The EIA must follow the same prescribed format as the EIS. An EIA must address every item in the outline provided by CEQ (see Fig. 1.) except item number eight. An EIS on the other hand must also address this last point which is a consideration of the other interests which offset the adverse environmental effects of the proposed action.

In practice the EIA and the EIS are almost identical. The procedure is essentially the same in preparing either one. Therefore, even if an agency believes that an EIA will suffice, it is only prudent to be as thorough and precise as possible from the outset. If it is determined that an EIS is required after the EIA has been completed and a format unsuitable for an EIS has been used, an entirely new effort would be required. (See Figure 2. for a schematic of the reporting process.)

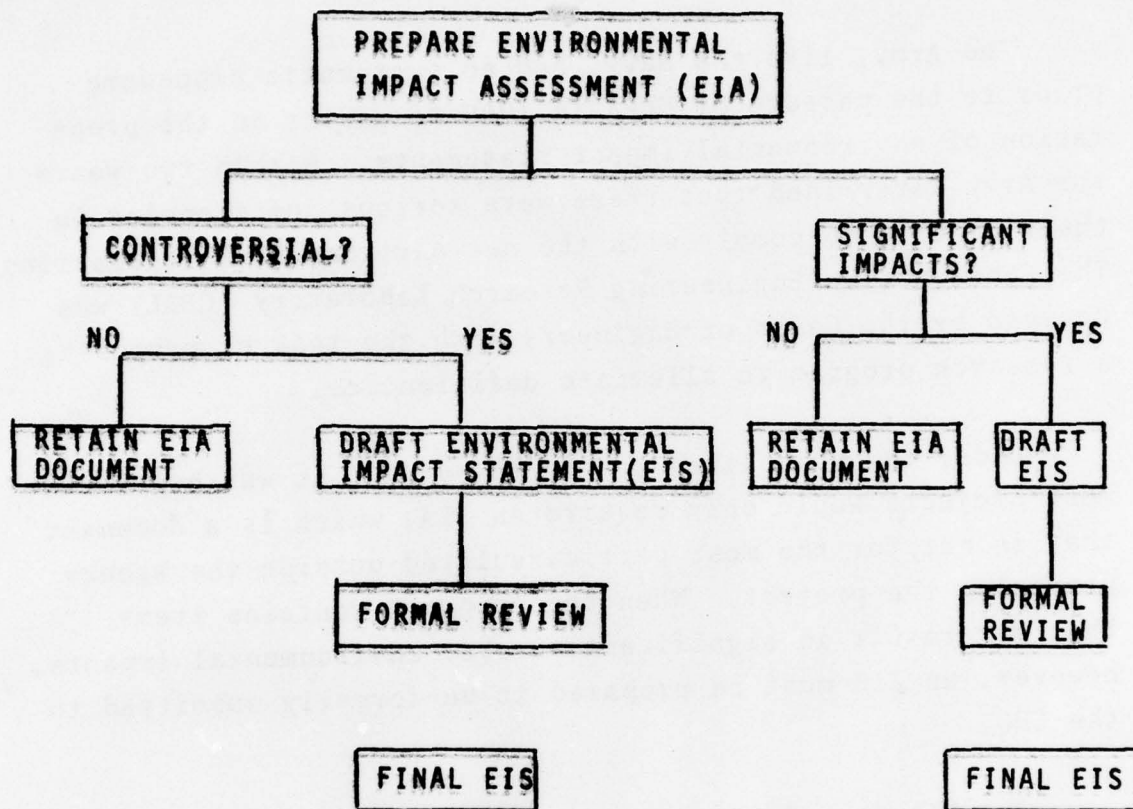


Figure 2. Flow of environmental impact assessments and statements and their interrelationship.

The Army has invested considerable sums to develop a systematic procedure for evaluating the environmental impacts of military activities. While this effort has been directed toward Army functions, all the military services engage in almost identical activities. The task of identifying and categorizing Army activities led to a classification scheme that is readily transferable to military operations regardless of which particular branch is involved. The activities peculiar to specific functions have been categorized by CERL as follows:

1. Administration and support
2. Construction
3. Industrial activities
4. Mission change
5. Operation and maintenance
6. Procurement
7. Real estate acquisition or outlease of land
8. Research, development, testing and evaluation
9. Training

These categories are deceptively simple in that they do not reflect at first blush the effort involved in developing the sub-categories of activities in each area.

The second and much more difficult step in developing a systematic process was to gather information to categorize those characteristics, or attributes, of the environment that would be affected by the various kinds of military activities. An extensive list of environmental attributes was compiled in an attempt to develop a model for predicting what sort of impacts on the environment might be caused by certain military activities.

Environmental attributes have also been placed into area categories for which recognizably different technical specialties have been developed. The list currently includes the following:

1. Ecology
2. Health science
3. Air quality
4. Surface water
5. Ground water
6. Sociology
7. Regional economics
8. Earth science
9. Land use
10. Noise
11. Transportation
12. Energy and Resource Conservation

The environmental impact matrix thus developed provides for prediction of approximately two million potential impacts. This includes a scale suggesting how significant or important an impact is likely to be along with the ramification an action is likely to have and possible ways to mitigate the adverse environmental impact. This computerized system known as EICS (Environmental Impact Computer System) provides a systematic approach to the writing of an EIS.

Should the user need still further information regarding the national and state laws that might apply, the Army has developed a Computerized Environmental Legislative Data System (CELDS). This is yet another step in the data collection process at CERL by which the legal parameters relating to the environment are established. This data base stores federal as well as state environmental legislation, regulations and standards.

CELDS is an up-to-date compilation of laws developed for use by non-lawyers. Abstracts of laws are printed in the language of the layman through this program, thus providing quick access to existing legal controls on activities that may have adverse environmental effects.

A final system developed to assist the writer of an EIS to respond to the economic aspect of CEQ's outline, is the Economic Impact Forecast System (EIFS). This program provides an estimate of effects on the Socioeconomic aspects of the environment caused by the expenditure of funds. The program, using census data, projects the economic impact of a project in terms of its effect on local business volume, personal income, and employment.

EIFS not only provides the particular economic details necessary to complete an EIS with regard to the possible adverse socioeconomic effects, but more importantly relieves the writer of the confusing task of determining which details should be addressed.

Since the economic impact of the project must be addressed, this program not only negates the necessity of the writer having to research the population and other economic data, it also avoids the need for his possessing the economic background which would qualify him to build and test the validity of such a model. This particular expertise is costly to acquire and may often not be available. Even if the talent is readily available, the process is extremely time consuming and thus costly.

FIELD TEST

In order to test the data bases developed by CERL, the authors decided to choose an actual project currently under construction at the U. S. Naval Academy. The project chosen required an EIS to be written and approved prior to beginning construction.

In the interest of authenticity it was decided to approach the task as though this were the initial attempt to receive authorization, rather than to use the already approved EIS as a pattern. The authors, therefore, were as novices in the field of EIS writing. The project was to build a short road bordered by a sea wall, however, the construction project itself is important to this report only insofar as it enables the researchers to determine the value of CERL's data bases in providing guidance.

CERL's system involves a three-step process.

1. The user submits an input matrix to CERL which is processed by a batch computer program called the Environmental Impact Computer Systems (EICS). (See Figure 3.)
2. The user then receives output from EICS in the form of a series of matrices. Each matrix refers to some topic of the EIS format provided by CEQ.
3. The appropriate matrices are then used in conjunction with the optional time-shared programs, to respond to CEQ's guidelines. More must be said about each step and also the optional supportive documents and programs.

267-2797

1. PROJECT NAME: _____

2. INSTALLATION: U.S. Naval Academy

3. RESPONDENT'S NAME: Profs. Skove & Cochran

ADDRESS: Political Science Dept.
U. S. Naval Academy
Annapolis, Md. 21402

TEL. NO. (COMM.) -3461
(F.T.S.) _____

4. ENVIRONMENTAL INFORMATION INPUT FOR SITE #: _____

5. NUMBER OF TECHNICAL SPECIALTIES 2

6. DETAIL OR REVIEW LEVEL? _____

7. NUMBER OF SUBPROGRAMS _____

8. IMPACT OPTION - A only - AB - ABC (circle one)

5 OUTPUT SELECTION: FACILITY CLASS CODE (SEE TABLE 2 FOR CODE NUMBERS)

[illegible]

10. ANSWERS TO FILTER QUESTIONS ABOUT THIS SITE:

B	TECHNICAL SPECIALTIES	0-1	0-2	0-3	0-4	0-5	0-6	0-7	0-8	0-9	0-10
	ECOLOGY	2	1	1	1	2	2	2	2	2	2
	ENV. HEALTH	1	2	1	2	1	2	2	1		
	AIR QUALITY	1	1	1	2	2					
	SURFACE WATER	2	3	1	1	2					
	GROUNDWATER	5	1	2	1						
	ECONOMICS	3	1	1	1	1	1	1	2		
	SOCIOLOGY	1	2	2							
	EARTH SCIENCE	2	2	2	1	2	1				
	LAND USE	1	2	1	2						
	NOISE	1	2	3	3	1					
	TRANSPORTATION	2	2	3	2						
	AESTHETICS	2	4	2	1	1					
	Energy & Resc. Consv.	1	2	3	3						

11. IS DD FORM 1390 AND 1391 ATTACHED YES NO; OR STATE
DOLLAR VALUE OF EACH FACILITY CLASS TO BE ASSESSED \$2,453,000.
AND NUMBER OF YEARS OF CONSTRUCTION FOR EACH FACILITY TO
BE ASSESSED 1 year.

FIGURE 3.

To begin step 1, the user receives a user's manual from CERL. This manual contains instructions, blank input matrices and the filter questions which are used to fill out the matrices. Figure 3 is the particular matrix used for this project. The process of filling out the matrix is relatively painless. The facility class code or codes, is determined from a table provided in the manual, and the appropriate technical specialties are checked. Next, the task of providing a mask for the data base in order to extract only data pertinent to this site is accomplished through answering a series of filter questions provided for each technical specialty selected. Figure 4 is an example of one filter question on Ecology. The code for the proper response for this site is the code number two. When filling out the matrix in Figure 3, therefore, a two is inserted under ecology question one.

Q U E S T I O N	R E S P O N S E
Which of the following responses best characterizes the general area where the project and associated activities will take place? (If more than one of the categories seems to apply, choose the one most typical of the site.)	<p>1.(Record one)</p> <p>(1) Ground cover mostly of tall grasses and/or weeds.</p> <p>(2) Ground cover mostly lawn grasses mowed several times per year, OR a majority of site taken by a building to be demolished, OR site is presently paved or graveled for use as a parking lot.</p> <p>(3) Frequent but scattered shrubs or small trees (less than 10 cm or 4 in. in diameter).</p> <p>(4) Continuous cover of shrubs or of larger trees (over 10 cm or 4 in.).</p> <p>(5) Most typical plants are marsh grasses, reeds, cattails, etc.</p>

FIGURE 4.

The next step in using EICS is to submit the input matrix of Figure 3 to CERL so that it may be used as input to the environmental data bank. The output of EICS is in the form of thirteen matrices for each construction category. The construction project at the U. S. Naval Academy included two construction activity classifications: "construction of roads and streets," and "waterfront operation facilities." The matrices are to be used to predict the impact of these construction activities on the environment.

It was decided to focus on one of the twenty-six matrices of CERL's output. The impact matrix on ecology in the category of Waterfront Operations is shown in Figure 5. Attributes within the broader area of ecology which may feel the impact of the operations are listed by numerical code across the top of the matrix. The list referred to by these codes is shown in Figure 6. This list is included in the output for each technical specialty. Care must be taken when writing the EIA/EIS that each of the possible effected attributes be considered.

The left-hand column, labeled BAAP NO. ____ (Basic Army Activity Programs), represents the basic activity which might present an environmental problem. Figure 7 represents the activities which may have an impact on the ecology of the area.

A matrix is formed by the intersection of the attributes with the activities referred to in the column of Basic Army Activity Programs. Intersections in the matrix are identified in a manner to indicate how significant the potential impact on the environment might be, and alert the individual preparing the EIA/EIS to the ramifications of certain activities on environmental attributes.

**RAM-MIT
CODE**

ATTRIBUTES

[illegible]

FIGURE 5.

SUB-PROGRAM = 1150 SUB-PROGRAM NAME = WATERFRONT OPER FAC
TECHNICAL SPECIALTY = ECOLOGY

<u>IMP. ATTRI. CODE</u>	<u>ATTRI. NAME</u>	<u>SUB-PARAMETRIC NAME</u>	<u>PARAMETRIC NAME</u>
2	Small Mammals	Kinds of Animals	Ecosystem
3	Birds	Kinds of Animals	Ecosystem
5	Reptiles	Kinds of Animals	Ecosystem
6	Amphibians	Kinds of Animals	Ecosystem
7	Insects	Kinds of Animals	Ecosystem
8	Other Animals	Kinds of Animals	Ecosystem
10	Trees	Kinds of Plants	Ecosystem
11	Shrubs	Kinds of Plants	Ecosystem
12	Herbs	Kinds of Plants	Ecosystem
14	Fungi	Kinds of Plants	Ecosystem
15	Lichens	Kinds of Plants	Ecosystem
17	Endangered Plant Species	Kinds of Plants	Ecosystem
18	Food Webs	System Stability	Ecosystem
19	Productivity	System Stability	Ecosystem
20	Seasonal Aspect	System Stability	Ecosystem
22	Successional Stage	System Stability	Ecosystem
28	Cold Water Fishing	Fishing	Wildlife Management
29	Large Lake Fishing	Fishing	Wildlife Management
30	Coastal Water Fishing	Fishing	Wildlife Management
32	Deep Sea Fishing	Fishing	Wildlife Management
33	Disease Vectors	Pests	Wildlife Management
34	Noxious Weeds	Pests	Wildlife Management
35	Other Undesirable Species	Pests	Wildlife Management
42	Encroachment on Natural Habitats		CNTRVSL
43	Threatened Species		CNTRVSL

FIGURE 6.

SUB-PROGRAM CODE = 1150 SUB-PROGRAM NAME = WATERFRONT OPER FAC

TECHNICAL SPECIALTY = ECOLOGY

<u>IMP. BAAP CODE</u>	<u>IMP. BAAP NAME</u>
60	Support Operations
61	Temporary Roads
64	Equipment Fueling/Maintenance
66	Solid Waste Disposal
67	Liquid Waste Disposal
73	Clearing Site
76	Draining Site
91	Brush Removal/Disposal
93	Lumber Removal/Disposal
94	Concrete Removal/Disposal
100	Excavation
102	Grading
104	Trench and Backfill Operations
105	Channeling
106	Dredging
120	Earthworks and Borrowing
122	Earth Excavation
124	Hauling Earth Materials
125	Dumping Earth Materials
126	Consolidate/Compact soil
147	Drain
167	Cofferdams
168	Dewatering
169	Drainage
180	Bituminous Construction
185	Placing-Bitum
187	Cuping/Sealing-Bitum
204	Mixing-Concrete
206	Hauling-Concrete
211	Strip and Clean Forms
227	Cleaning
262	Pest/Insect Protection
285	Furbishing (Landscape-Planting-Seeding)

FIGURE 7.

Each cell in the matrix will have an A, B, C, or will be left blank. These letters indicate how significant the environmental impact is likely to be and provide him with a "need-to-consider" scale. In the scale that was developed:

- A - indicates that one must definitely consider that factor as potentially being impacted by that activity and attention must be given to the factor in preparing the EIS.
- B - indicates that there may possibly be an environmental impact caused by that activity. The preparer of the EIS must use his judgment in assessing the consideration in preparing the Statement.
- C - indicates that the impact will be slight or even negligible. However, special circumstances would suggest that these be considered in the Statement.
- Blank - a blank cell at the intersection of a particular attribute and activity suggests that there will not be any environmental impact of significance and may be disregarded in writing the EIS.

The right-hand column of the matrix (see Figure 5) contains a "Ram/Mit Code." This consists of a series of code numbers, which will refer the user to a Ramification Mitigation printout that consists of a listing by numbered code of:

- 1) The ramification remarks, which give an explanation of the potential environmental impact resulting from the interaction between the activity and the environmental attribute.
- 2) When requested by the user, the explanation of the harmful or controversial impact is followed by suggested measures to lessen or avoid the undesirable effect. These suggestions of means to minimize undesirable factors and the suggestion of alternatives should save the writer of an EIS a

great deal of time in preparing a report that adequately protects the environment and will satisfy the requirements of CEQ.

It must be emphasized that the following list (Figure 8) is not the complete listing of Ram/Mit Codes for ecology, but only a list of those which must be addressed by the "A" elements of Figure 5.

E C O L O G Y

Ram/Mit
Code

- 1061 /RAMIFICATIONS/
Construction of temporary access roads may represent the first major intrusion into a remote building site. Numerous superfluous roads may cause more terrain damage than the project itself.
- /MITIGATIONS/
Plan access roads carefully: Improve them if necessary: Then restrict development of all other roads and paths.
- 1064 /RAMIFICATIONS/
Vehicle fueling and servicing areas, especially temporary ones, may lack precautions against disposal of petroleum wastes on the soil surface or in drainage ways where it then damages aquatic life.
- /MITIGATIONS/
Require that fuel and oil storage be diked and that drain oil be removed from the site in closed containers and disposed of properly, preferably by sale to reclaimers.
- 1066 /RAMIFICATIONS/
Temporary, onsite disposal of packing materials and other organic debris may lead to increased populations of rats, mice, roaches, termites and other undesirable animals.
- /MITIGATIONS/
Require, by contract provision or by providing service, that all organic solid waste be disposed of in approved landfill or incinerator no less frequently than once a week.

FIGURE 8.

Ram/Mit
Code

1067

/RAMIFICATIONS/

Temporary toilet facilities may cause severe, hazardous contamination of small, local drainage ways.

/MITIGATIONS/

Require that all temporary toilets on sites be equipped with approved septic tanks with safe drainages or with closed holding tanks which are emptied only into approved treatment plants, and never dumped into waterways, or on the soil surface on or off the installation.

1073

/RAMIFICATIONS/

Removal of trees drastically alters the ecological balance and aesthetic interest of any area where it is done. It removes habitat for many animals, removes food sources for still others, stresses remaining smaller plant associations and often leads to increases in plant and animal pests.

/MITIGATIONS/

Removal of trees is an unavoidable impact if the site is to be used, but contracts should clearly specify limits of clearing. Alternate sites might be used if forested areas are locally scarce.

1074

/RAMIFICATIONS/

Grubbing totally destroys any plant and animal associations which remain after trees are cut, and less desirable species often replace them. Surface soil is disturbed and subsequent erosion may impact plant and animal life in nearby bodies of water.

/MITIGATIONS/

Use of heavy earthmovers for grubbing should be limited to sites with less than 10- average slope. Steeper sites should be grubbed by hand-operated tools. Reseeding of adapted grasses should follow grubbing by no more than one week except on areas within foundation perimeter even if more grading may eventually be done in following months.

1075

/RAMIFICATIONS/

Removal of stumps further disturbs the ecosystem only if several months or years have elapsed since clearing or grubbing, and a semi-wild state has been established. Most damage will have been done in previous stages.

FIGURE 8 (cont'd)

Ram/Mit
Code

1075

/MITIGATIONS/

Removal of stumps should preferably be by grinder or backhoe rather than by bulldozer, especially on sites with greater than 10- average slope. Holes remaining should be filled immediately and seeded with a cover grass to avoid standing water hazard.

1076

/RAMIFICATIONS/

Naturally wet sites support a very wide variety of plant and animal species. Drainage of these sites may have far-reaching secondary effects on other animal populations which depend on the marshy areas for food production.

/MITIGATIONS/

If naturally wet sites must be utilized for lack of an alternate, these effects are unavoidable. Indiscriminate drainage of all wet sites where no pressing plans exist for use of the area is environmentally unacceptable.

1101

/RAMIFICATIONS/

When the upper strata of the soil are removed, all plants and almost all animal species are destroyed. Subsequent erosion of the area may also lead to siltation of nearby bodies of water.

/MITIGATIONS/

Soil should be stripped from as small an area as possible. Spoil piles which will remain longer than 45 days must be seeded heavily with annual grasses immediately. Sediment traps must be used if any water bodies are within 200 m. (about 600 ft) downslope.

1102

/RAMIFICATIONS/

All grading operations risk exposing loose soil to wind and water erosion. Such erosion causes degradation of water and air quality. Remaining plant and animal communities will be destroyed if covered by soil.

/MITIGATIONS/

Grading should follow natural contours if possible, and should rarely exceed a 10- average slope. Seeding or sodding with ground cover species should follow final grading within 7 days. Work should be planned so that at least 5 meters (about 16 ft) of undisturbed vegetation are left between the site and any water body.

FIGURE 8 (cont'd)

Ram/Mit
Code

1104

/RAMIFICATIONS/

Trenches for utilities extensions often cut root systems of desirable ornamental trees and expose weed seeds in the replaced fill.

/MITIGATIONS/

Utilities trenches should not come closer than 10 meters (about 30 feet) to any very large trees that are to be saved, and no less than half this distance to any tree. Backfilled trenches should be compacted and seeded immediately.

1105

/RAMIFICATIONS/

Drainage channels lower water tables and may cause downstream siltation. These effects often lead to death of some tree and fish species in affected areas.

/MITIGATIONS/

Qualified drainage engineers should determine that no more than absolutely necessary is drained, and that nearby natural areas, if any, are not accidentally drained in the process. Silt traps may be necessary in outfalls.

1106

/RAMIFICATIONS/

Dredging of bottom sediments destroys bottom life for many years if done in a natural stream or coastal area. In highly disturbed areas, dredge spoil is often contaminated by many toxic chemicals, and its disposal may cause health problems.

/MITIGATIONS/

This is an unavoidable impact if the channel needs to be deepened for use. Dredge spoils must be placed in confinement areas rather than being dumped back into the water.

1120

/RAMIFICATIONS/

All borrow areas have the potential to create severe erosion hazards and become unsightly permanent scars. Standing waters in borrow pits may harbor mosquitos and other pests.

/MITIGATIONS/

Sediment retaining structures must be used if drainage from a borrow area flows into a nearby water body. Soil borrow pits should be graded and seeded immediately after use. Standing water in pits may need to be treated with approved larvicides for mosquito control.

Ram/Mit
Code

1121

/RAMIFICATIONS/

Severe disturbance of the upper layers of the soil destroys most existing plant and animal communities and leaves loose soil which may be eroded by wind and water, or invaded by aggressive weedy species.

/MITIGATIONS/

Soil should be removed from as small an areas as possible, and as close to the date of use as possible. Sediment traps must be used if any water body is within 200 m (about 600 feet) downslope.

1122

/RAMIFICATIONS/

Excavation of borrow areas creates new habitats for many weedy plants and for animal pests and possible disease vectors, such as mosquitos. Erosion from borrow areas is often severe with subsequent turbidity and siltation in nearby water bodies.

/MITIGATIONS/

Excavation should be planned to avoid standing water problems and to allow for easy regrading back to gentle contours with few slopes exceeding 15-. Temporary reseeding with annual grasses should be done any time more than 30 days will elapse between borrowing operations. Permanent revegetation should be accomplished within 30 days of abandonment of site. Temporary silt traps downslope be needed.

1125

/RAMIFICATIONS/

When fill is dumped and spread, or when excess spoil is disposed of, a fill depth greater than about 15 cm (about 6 in) will cause the decline and death of most desirable tree species whose roots are covered.

/MITIGATIONS/

By contract provision, mark those trees over 20 cm (8 in) in diameter which are to be saved. Require placement of approved porous rock fill or construction of dry wells or tile fields over those portions of the root system which must be covered by more than about 15 cm (6 in) of earth fill. Seed all bare soil immediately.

1167

/RAMIFICATIONS/

Construction requiring a cofferdam will destroy all bottom life and the fish and other animals dependent upon it for

FIGURE 8 (cont'd)

Ram/Mit
Code

1167

/RAMIFICATIONS/ continued
a relatively wide area around the site. Recovery may take 10 years or more after construction ceases.

/MITIGATIONS/

If a cofferdam must be used, much of the impact is unavoidable. Spoil removed from the site must never be disposed of in the water, but should be allowed to dry on land in confinement. The start of construction should be planned for a time other than early summer, as this is the time when fish populations are most vulnerable.

1168

/RAMIFICATIONS/

Dewatering of caissons, cofferdams and foundations produces large quantities of silt-laden water which is often also polluted by toxic chemicals and petroleum. This water may rapidly destroy aquatic life far removed from the actual site.

/MITIGATIONS/

Some of this impact is unavoidable, but timing it for other than early summer helps to reduce effects on fish reproduction. Silt traps are necessary if water is turbid.

1187

/RAMIFICATIONS/

The first runoff waters from new bituminous pavement contain high levels of chemicals toxic to aquatic life.

/MITIGATIONS/

A small temporary retention area should be constructed which will hold the equivalent of a 6 mm (1/4 in) rain running off the paving. The chemicals soak into the soil with less damage. Heavier rains dilute the concentration satisfactorily.

1285

/RAMIFICATIONS/

Landscaping with exotic species or with poorly adapted species has often introduced weeds and pests into disturbed areas around construction sites where they flourish. Fungicides, insecticides and fertilizers used on new plantings often wash into bodies of water upsetting existing plant and animal life.

FIGURE 8 (cont'd)

Ram/Mit
Code

1285

/MITIGATIONS/

Use certified seed sources and nursery stock known to be adapted to the area. Plant immediately following construction so site is not left open to invasion. Follow label directions in use of chemical products rigorously. Apply fertilizers in quantities calculated not to easily leach out of the soil.

FIGURE 8 (cont'd)

The major utility in the use of the Ram/Mit Codes is to direct the writer's attention to the potential problems caused by a particular impact of an activity upon some ecological attribute that must be addressed. For example, activity number 106 in Figure 5 suggests that attributes: 8(other animals), 28(cold water fishing), 29(large lake fishing) may be adversely affected by the activity of dredging and must be addressed as they received an A in the matrix cells. The program suggests all possible harmful effects at any possible site. It is the responsibility of those preparing an EIS to determine if all the attributes referred to in Figure 5 are relevant to his particular site. In this field test, attribute number 29 can be discounted as irrelevant since there are no lakes in the vicinity. The two remaining affected attributes (harmful effects on other animals, and cold water fishing) remain to be considered.

The ramification (1106, Figure 8) is concerned with the likelihood that dredging often contaminates the water with toxic chemicals and may destroy bottom life for many years. The mitigation also suggested by 1106 states that "This is an unavoidable impact if the channel needs to be deepened for use. Dredge spoils must be replaced in confinement areas rather than being dumped back into the water."

In determining what methods will be used in implementing the suggested mitigations, the writer may have need of information regarding federal or local legal requirements, or factors concerning population size, density, or other economic variables. CERL has provided an additional program to assist in this effort.

CELDS

In order to use this time-sharing program in support of EICS, the writer must receive a user number and password from CERL. If the user intends to use this system at a location other than Champaign - Urbana, he must be able to provide his own computer terminal and have access to a telephone line. This has the advantage of allowing the user to remain at his usual work installation and only call upon the program as the need arises. The flexibility of this system is illustrated by the fact that the user may query the system spontaneously as the ramifications and mitigations suggest that legal clarification is needed.

When these needs arise the writer has many options as to the amount and content of the system response. As an experiment in our particular field test, we were interested in the geographical and political scope (GPS) of the State of Maryland in which the construction project was taking place. As an example, for our project we queried CELDS by first specifying that we were interested in the GPS United States. The response from CELDS was that there were 265 laws found and these were being held in a file awaiting our next instruction. Since we were interested in both federal legislation and laws enacted by the State of Maryland, we then typed the Boolean request "or" GPS Maryland. The system responded by reporting that its file of applicable laws had now been increased to 328.

The next step was to reduce these 328 laws to only those which applied to our particular activity. In an effort to further narrow the file the Boolean command "and [Major Environmental Category] MEC Earth Science" was inserted. The system responded by stating that only three laws remained in the file. In our judgment we had now understated the description of our activity. Upon typing "or MEC Land Use," the system reported that the file had been increased to 92 laws.

In summary the file now contained 92 laws which were enacted by the federal government or the State of Maryland, and which referred to either Earth Science or Land Use. The entire process of gathering the legal data from the system took approximately three minutes.

It remained for the authors to discern what information they needed from this legal file. The options available include the ability to list various types of information concerning the laws. The user may list only the titles of the laws placed in his file. Titles give an indication of the purpose and scope of the law. Titles of some laws may suggest to the user that further investigation is warranted. For example, he may wish to see an abstract of the law by typing "LIST ABS." The abstract consists of a concise paragraph stating the essential aspects of the legislation. In addition, the following commands are available for listing other pertinent information concerning the law:

- a) DAT, the effective date of the law;
- b) REF, the official legal source of the law;
- c) AGY, the name and address of the organization responsible for the administration of the law;
- d) BIB, contains the source from which the law was abstracted;
- e) TBL, the quantifiable data, if contained in a law, can also be printed in a table;
- f) ATT, CERL's effort to index the law by its relevant environmental attributes;

g) KEY, key words that categorize and describe the environment may be used to locate pertinent legal information.

For example, from the previous file containing ninety-two laws, the following sequence took place:

WHAT NEXT?: AND KEY DREDGING
8 LAWS REMAIN

WHAT NEXT?: OR KEY ESTUARIES
17 LAWS NOW SELECTED

WHAT NEXT?: OR KEY FLOOD CONTROL
29 LAWS NOW SELECTED

WHAT NEXT?: LIST TTL

LAW 384
TTL: THERMAL DISCHARGES INTO ESTUARIES.

LAW 392
TTL: PERMITS TO ALTER STREAMS OR ERECT STRUCTURES.

LAW 625
TTL: PERMITS FOR ACTIVITIES AFFECTING COASTAL WETLANDS, INCLUDING DREDGING NEW CHANNELS.

LAW 972
TTL: USE OF SHOTS IN BAYS AND INLAND WATERS.

LAW 1047
TTL: THERMAL DISCHARGES INTO ESTUARIES.

LAW 1057
TTL: PROHIBITED DISCHARGES TO ENCLOSED BAYS AND ESTUARIES.

LAW 1183
TTL: WATER QUALITY STANDARDS - PH.

LAW 1184
TTL: WATER QUALITY STANDARDS - TEMPERATURE.

LAW 1232
TTL: PERMITS FOR COASTAL AREAS ACTIVITIES.

LAW 1275
TTL: SHORELANDS PROTECTION

LAW 1560
TTL: DREDGING OR ALTERING COASTAL WETLANDS.

LAW 1561

TTL: PERMITS TO ALTER COASTAL WETLANDS, AND EXEMPTIONS.

LAW 1703

TTL: HEAT POLLUTION.

LAW 2098

TTL: PERMITS TO DRAIN WATERS AND BUILD DAMS.

LAW 2140

TTL: MINERALS EXTRACTION, SHORELINE DEVELOPMENT, AND SALT MARSH ALTERATION.

LAW 2302

TTL: PERMITTED USES IN FLOODWAYS.

LAW 2330

TTL: TIDAL WETLAND ACTIVITIES.

LAW 2367

TTL: PROTECTION OF SCENIC AND RECREATIONAL RIVERS.

LAW 2375

TTL: PERMIT REGULATIONS FOR WETLAND ACTIVITIES.

LAW 2400

TTL: CONSTRUCTION PERMITS FOR DAMS, DIKES OR LEVEES.

LAW 2402

TTL: SOIL AND WATER CONSERVATION DISTRICTS.

LAW 2445

TTL: FLOODWAY USES.

LAW 2446

TTL: FLOOD CONTROLS WORKS AND FLOOD PROOFING REQUIREMENTS.

LAW 2494

TTL: FLOOD PLAIN AREA USES.

LAW 2495

TTL: FLOOD CONTROL MEASURES

LAW 2527

TTL: DAM CONSTRUCTION.

LAW 2537

TTL: PERMITS FOR FLOOD CONTROL WORKS AND WATER USES.

LAW 2768

TTL: CONSTRUCTION PERMITS FOR FLOOD PLAINS.

From this list of titles one could choose by accession number any or all laws that would seem to apply to his project. The next step might then be to list the abstracts or any other field of information that is needed by the user.

As an alternative, consider the file previously discussed that included 92 laws pertaining to the GPS United States and Maryland in the field of Earth Science or Land Use. All available information in the data base will be displayed by typing the command "LIST ALL" as shown below:

LAW 212
ACC: 212
TTL: RAILROAD CONVEYANCES; DISCHARGE OF WASTE
DAT: 02-06-75
REF: CODE OF FEDERAL REGULATIONS; TITLE 21: FOOD AND DRUG;
CHAPTER I: FOR, HEW; PART 1250: INTERSTATE CONVEYANCE
SANITATION; SUBPART C; SECTION 1250.51.
MEC: SOLID WASTE
LAND USE
GPS: US
AGY: PUBLIC HEALTH SERVICE
200 C ST., WASHINGTON, DC 20204
BIB: SAME AS LEGISLATIVE REFERENCE.
ABS: RAILROAD CONVEYANCE FIRST USED AFTER 7/1/72: HUMAN
GARBAGE WASTE WATER OR OTHER POLLUTING MATERIALS
SHALL ONLY BE DISCHARGED AT APPROVED SERVICING AREAS.
SUCH MATERIAL AS HAS BEEN SUITABLY TREATED TO PREVENT
SPREAD OF COMMUNICABLE DISEASES MAY BE DISCHARGED ELSEWHERE,
BUT NOT AT STATIONS.
NON-NEW RAILROAD CONVEYANCES: NO DISCHARGE EXCEPT AT
APPRS
OVED SERVICING AREAS AFTER 12/31/74 (EXTENSION MAY BE GRANTED
BY COMMISSION OF FOOD AND DRUGS). THESE MATERIALS
SUITABLY TREATED TO PREVENT SPREAD OF COMMUNICABLE DISEASES
MAY BE DISCHARGED BUT NOT AT STATIONS. IN THIS REGULATION
WASTE WATER AND OTHER POLLUTING MATERIALS DO NOT INCLUDE
DRAINAGE OF DRINKING WATER TAPS OR LAVATORY FACILITIES.
TOILETS SHALL BE KEPT LOCKED WHEN RAILROAD CONVEYANCE
IS AT A STATION OR SERVICING REA UNLESS MEANS ARE PROVIDED
TO PREVENT CONTAMINATION OF AREA OR STATION.
TEL: NONE
ATT: POLLUTION FROM RAILWAYS
KEY: BACTERIA
SEWAGE
WASTE DISPOSAL
RAILROADS

LAW 280
ACC: 280
TTL: NATIONAL WILDLIFE REFUGE SYSTEM: USE OF NATURAL RESOURCES.
DAT: 12-15-66
REF: CODE OF FEDERAL REGULATIONS; TITLE 50: WILDLIFE AND FISH-
ERIES; CHAPTER I: U.S. FISH AND WILDLIFE SERVICE, OOI;
PART 29: LAND USE MANAGEMENT, SECTION 29.1.
SUBCHAPTER C: NATIONAL WILDLIFE REFUGE SYSTEM, SECTION 29.1
MEC: LAND USE
ECOLOGY
GPS: US
AGY: U. S. FISH AND WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR
WASHINGTON, D.C. 20240
BIB: SAME AS LEGISLATIVE REFERENCE
ABS: ALL WILDLIFE REFUGE AREAS ARE MAINTAINED FOR THE FUNDAMENTAL
PURPOSE OF DEVELOPING A NATIONAL PROGRAM OF WILDLIFE
CONSERVATION AND REHABILITATION. THE AREAS ARE FOR
RESTORATION, PRESERVATION, DEVELOPMENT, AND MANAGEMENT OF
WILDLIFE HABITAT; FOR PROTECTION AND PRESERVATION OF
ENDANGERED OR RARE WILDLIFE AND THEIR HABITAT AND FOR THE
MANAGEMENT OF WILDLIFE IN ORDER TO OBTAIN MAXIMUM PRODUCTION
FOR PERPETUATION, DISTRIBUTION, DISPERSAL AND UTILIZATION.
TEL: NONE
ATT: CONSUMPTION OF LAND
ENCROACHMENT ON NATURAL HABITATS
KEY: WILDLIFE

LAW 284
ACC: 284
TTL: RESERVOIR PROJECT LANDS.
DAT: 7-2-66
REF: CODE OF FEDERAL REGULATIONS; TITLE 43: PUBLIC LANDS;
SUBTITLE A: SECRETARY OF THE INTERIOR; PART 8: JOINT
POLICIES OF OOI AND DEPT. OF ARMY RELATIVE TO RESERVOIR
PROJECT LANDS, SECTION 8.0 - 8.6.
MEC: LAND USE
ECOLOGY
EARTH SCIENCE
GPS: US
AGY: DEPARTMENT OF THE INTERIOR
C STREET, WASHINGTON, DC 20240
BIB: SAME AS LEGISLATIVE REFERENCE.
ABS: ACQUISITION OF LANDS FOR RESERVOIR PROJECT CONSTRUCTION
WILL INCLUDE ADDITIONAL LAND AREAS TO ASSURE REALIZATION
OF OPTIMUM PRESENT AND FUTURE OUTDOOR RECREATIONAL AND FISH
AND WILDLIFE POTENTIALS. FEE TITLES WILL BE REQUIRED FOR
THE FOLLOWING: (A) LANDS NECESSARY FOR PERMANENT STRUC-
TURES. (B) LANDS BELOW THE MAXIMUM FLOWAGE LINE OF THE
RESERVOIR INCLUDING LANDS BELOW A SELECTED FREEBOARD WHERE
NECESSARY TO SAFEGUARD AGAINST THE EFFECTS OF SATURATION,

WAVE ACTION, AND BANK EROSION AND TO PERMIT INDUCED SURCHARGE OPERATION. (C) LANDS NEEDED TO PROVIDE FOR PUBLIC ACCESS TO THE MAXIMUM FLOWAGE LINE OR FOR OPERATION AND MAINTENANCE OF THE PROJECT. (D) SUCH LANDS AS ARE NEEDED TO MEET PRESENT AND FUTURE REQUIREMENTS FOR FISH AND WILDLIFE AS DETERMINED PURSUANT TO THE FISH AND WILDLIFE COORDINATION ACT. (E) SUCH LANDS AS ARE NEEDED TO MEET PRESENT AND FUTURE PUBLIC REQUIREMENTS FOR OUTDOOR RECREATION, AS MAY BE AUTHORIZED BY CONGRESS. EASEMENTS IN LIEU OF FEE TITLE ARE ALLOWED ONLY WHEN LANDS ARE ABOVE THE STORAGE POOL AND ARE IN REMOTE PORTIONS OF THE PROJECT AREA AND ARE OF NO SUBSTANTIAL VALUE FOR ENHANCEMENT OR PROTECTION OF FISH AND WILDLIFE OR OUTDOOR RECREATION AND EASEMENT WOULD BE FINANCIALLY ADVANTAGEOUS. BLOCKING OUT WILL FOLLOW SOUND REAL ESTATE PRACTICES AND NORMALLY LAND WILL NOT BE ACQUIRED TO AVOID SERVERANCE DAMAGE IF THE OWNER WILL WAIVE SUCH DAMAGE. MINERAL, OIL AND GAS RIGHTS WILL NOT BE ACQUIRED EXCEPT WHERE DEVELOPMENT THEREOF WOULD INTERFERE WITH PROJECT PURPOSES, BUT MINERAL RIGHTS NOT ACQUIRED WILL BE SUBORDINATED TO GOVERNMENT'S RIGHT TO REGULATE THEIR DEVELOPMENT IN A MANNER THAT WILL NOT INTERFERE WITH THE PRIMARY PURPOSES OF THE PROJECT INCLUDING PUBLIC ACCESS. BUILDINGS FOR HUMAN OCCUPANCY AS WELL AS OTHER STRUCTURES WHICH WOULD INTERFERE WITH THE OPERATION OF THE PROJECT ARE PROHIBITED.

TEL: NONE

ATT: CONSUMPTION OF LAND

OTHER POTENTIALLY CONTROVERSIAL ASPECTS

COMMUNITY MAINTENANCE

INDUCED LAND USE CHANGES

KEY: IMPOUNDMENTS OF WATER

WILDLIFE

RECREATION AREAS

Note that not only is the abstract of the law displayed, but also complete information as to the source of the law is printed in case further investigation is warranted. Once again the time saved in using CELDS, as opposed to compiling this legal information as a special project for each EIS, justifies the cost in maintaining a system of this type.

The planner will need additional information concerning economic variables in completing the EIS. CERL has developed a program named the Economic Impact Forecast System (EIFS) to deal with this aspect of writing an EIS.

EIFS

An EIS must include a consideration of the socio-economic effect on the environment as well as an analysis of the physical aspects of the ecological setting. CERL has developed a program to be used by the writer in addressing this topic.

This program, like CELDS, is time-shared, so the user may have access to this aid at remote locations. However, it differs from CELDS in that rather than merely drawing items from a data base, it also provides a series of economic models.

In the event that the writer of an EIS chooses to perform some particular analysis of the economic and population levels of the area, and then develop his own prediction as to the expected impact created by this intrusion, complete profiles are available in the program. CERLS programs include an overview profile which provides selected demographic and economic data for an area involving more than one county. Another profile provides the same information for a single county in the event that a project essentially has no spillover effect into other areas.

We were able to obtain for our project the following profile data for Anne Arundel County, Maryland:

FIRST COUNTY OR REGION: ANNE ARUNDEL, MD

NEXT COUNTY (OR <CR> IF DONE):

YOU HAVE SELECTED:

COUNTY	STATE	POPULATION	AREA (SQ MI)
ANNE ARUNDEL	MD	297,539	423
TOTAL		297,539	423

WHAT PROFILE (<CR> TO SEE LIST):

TYPE 1 FOR OVERVIEW PROFILE

TYPE	2	FOR OVERVIEW BY COUNTY
TYPE	3	FOR TIME SERIES PROFILE
TYPE	4	FOR THE FORECAST MODEL
TYPE	5	FOR VALADO PROFILE
TYPE	6	FOR RTV
TYPE	7	FOR DETAILED EMPLOYMENT PROFILE
TYPE	8	TO INPUT YOUR OWN MULTIPLIER
TYPE	-	TO SELECT A DIFFERENT REGION
TYPE	CNTRL-D	TO LEAVE THE PROGRAM

WHAT PROFILE (<CR> TO SEE LIST): 1

CITY COUNTY DATA BOOK

LAND AREA 423 SQUARE MILES
TOTAL POPULATION: 297,539

POP DENSITY: 703.40

BUSINESS VOLUME -- 1967

MANUFACTURING:	\$	225,900,000.00
RETAIL:		408,874,000.00
SERVICE:		44,784,000.00
WHOLESALE:		288,851,000.00

CENSUS OF BUSINESS, 1972

DIR GEN EXPEND:	154,943,000.00
EDUCATIONAL EXPEND:	83,477,000.00
TOTAL ASSESSED VALUE:	978,940,000.00
ASSESSED TO SALES PRICE RATIO:	39.70
PROPERTY TAXES:	41,165,000.00
VALUE ADDED -> MFGR:	282,000,000.00
RETAIL SALES:	742,245,000.00
SERVICE RECEIPTS:	114,089,000.00
WHOLESALE SALES:	585,853,000.00

2ND COUNT CENSUS, 1970

POPULATION BY AGE AND SEX:

AGE	MALE	FEMALE	TOTAL
0	2,632	2,312	4,944
1	2,589	2,502	5,091
2	2,668	2,408	5,076
3	2,730	2,665	5,395
4	2,957	2,814	5,771
5	3,160	3,015	6,175
6	3,253	3,231	6,484
7	3,259	3,094	6,353
8	3,299	3,276	6,575
9	3,299	3,246	6,545
10	3,530	3,456	6,986
11	3,374	3,238	6,612
12	3,474	3,239	6,713
13	3,245	3,093	6,338
14	3,170	3,005	6,175
15	3,081	2,995	6,076
16	2,946	2,726	5,672
17	2,847	2,659	5,506
18	2,930	2,244	5,174
19	3,317	2,091	5,408
20	3,614	2,076	5,690
21-25	15,544	11,313	26,857
26-30	11,537	11,078	22,615
31-35	9,861	9,471	19,332
36-40	9,702	9,251	18,953
41-45	9,490	9,270	18,760
46-50	9,113	9,166	18,279
51-55	7,260	6,966	14,226
56-60	5,547	5,494	11,041
61-65	4,079	4,156	8,235
66-70	2,721	3,174	5,895

71-75	1,639	2,274	3,913
76-80	970	1,551	2,521
> 80	806	1,347	2,153

AGGREGATE \$ MONTHLY CONTRACT RENT --

RENTER OCCUPIED: 2,324,456.00

VACANT FOR RENT: 109,465.00

COUNT OF OCCUPIED UNITS BY TENURE --

OWNED OR BEING BOUGHT: 56,924

COOPERATIVE OR CONDO 174

RENTED FOR CASH RENT: 20,235

RENTED NO CASH: 3,803

4RTH COUNT POPULATION, 1970

POPULATION ENROLLED IN SCHOOL BY AGE (15%) --

AGE	STUDENTS
3- 4	1,273
5- 6	9,567
7-13	44,881
14-15	12,026
16-17	10,003
18-19	5,555
20-21	3,122
22-24	1,621
25-34	2,362

Count of employed persons by industry

1	1,506	Agriculture, forestry, and fisheries
2	1 9	Mining
3	8,569	Construction
4	458	Furniture and lumber and wood products
5	1,164	Primary metal industries
6	1,089	Fabricated metal industries
7	1,155	Machinery, except electrical

8	4,709	Electrical machinery, equipment and supplies
9	2,220	Motor vehicles and other trans. equipment
10	2,462	Other durable goods
11	1,352	Food and kindred products
12	673	Textile mill and other textile products
13	1,842	Printing, publishing, and allied industries
14	2,392	Chemical and allied products
15	1,735	Other nondurable goods
16	947	Railroads and railway express service
17	1,787	Trucking service and warehousing
18	2,295	Other transportation
19	1,458	Communications
20	2,034	Utilities and sanitary services
21	3,723	Wholesale trade
22	2,460	Food, bakery, and dairy stores
23	3,048	Eating and drinking places
24	3,881	General merchandise retailing
25	2,524	Motor vehicles retailing and service stations
26	5,031	Other retail trade
27	1,449	Banking and credit agencies
28	2,990	Insurance, real estate, and other finance
29	2,028	Business services
30	1,508	Repair services
31	1,358	Private households
32	2,365	Other personal services
33	905	Entertainment and recreation services
34	2,770	Hospitals
35	1,409	Med. and other health services except hospitals
36	7,379	Government
37	1,357	Private
38	474	Other education and kindred services
39	1,189	Welfare, religious, and nonprofit organizations
40	3,412	Legal, engineering, and misc. professional services
41	16,517	Public Administration

The County profile above has been included in the interest of completeness. Many writers of EIS reports would prefer to make their predictions concerning the socioeconomic impact of a project on the basis of their own extrapolations from raw data. In that event this program provides a significant data base from which to begin construction of their model. Other profiles, a Time Series Profile, Valado Model, and a Rationals Threshold Values Model would also be useful in such an effort because they list certain economic and business trends over several years. This would be invaluable information for anyone constructing his own model.

It is more likely that most individuals preparing a report would prefer to use the Economic Forecast Model rather than prepare their own. As shown below, the model predicts the economic impact for four distinct functional areas. In this example, construction was the functional area chosen for Anne Arundel County, Maryland

ECONOMIC FORECAST MODEL FOR ANNE ARUNDEL COUNTY, MARYLAND

Functional Area? (<CR> to see list):

Type 1	For construction
Type 2	For operations, maintenance and repair
Type 3	For training
Type 4	For mission change
Type -	To return to profile selection
Type contrl-D	To leave EIFS

Functional Area? (<CR> to see list):

CONSTRUCTION

Project Name: UNSAEIS

Dollar volume of project: 2,453,000

Percent of local labor: 50

Percent of local materials: 90

Average income of military personnel: 0

Number families moving onto base from local region: 0

Economic Impact Forecast for USNAEIS

Direct volume:	\$	1,829,000.00	
Export employment multiplier:		2.1389	
Change in total business volume:	\$	3,911,000.00	(0.227%)
Induced business volume:	\$	2,082,000.00	
Change in local personal income:	\$	3,139,000.00	(0.213%)
Change in expenditures for housing:	\$	565,000.00	
Change in non-housing expenditures:	\$	1,978,000.00	
Change in local employment:		378	(0.339%)
Assessed to market value ratio:		39.70	
Change in local property values:	\$	5,593,000.00	(0.227%)
Change in housing investment:	\$	263,000.00	
Change in non-housing investment:	\$	237,000.00	
Change in tax revenues:	\$	326,000.00	
Change in number of school children:		0	(0.000%)
Change in state and fed aid to schools:	\$	0.00	
Change in cost to schools:	\$	0.00	
Change in other local government costs:	\$	162,000.00	
Net change in costs to local gov:	\$	162,000.00	

It is the opinion of the authors that this presents the greatest time saving opportunity of the profiles offered.

An EIS must address the economic impact of a construction project on the local economy. When information concerning the project is fed into the computer, the forecast model will respond with estimates of the financial impact on the community. The program requires that the writer indicate the cost of the project as well as the percentage of labor and materials from the local area that will be used. In this instance, when the computer asked for the average income of military personnel and the number of people who would be moving onto the base, knowing the project will not result in more military personnel being assigned to the Academy, the writers responded with a zero.

From the printout below it is clear that the project will not have a major impact on the economic activity of Anne Arundel County. This is due mainly to the fact that the county is large with a sizeable population (297,539 as of the census in 1970) and is relatively affluent. All changes that do occur in the local economy are apparently beneficial.

The model predicts that the project will cause an increase in business volume amounting to \$2,082,000. Jobs created by the construction directly, as well as the additional demand created by the hiring of these workers, will increase personal income in the county by \$3,139,000 (or .213%). It would appear, according to the model that a project of this size will create directly and indirectly approximately 378 jobs in the county for the year. Or, stated differently, it will result in a decrease in the unemployment rate of 0.339%.

The program also states that the project can be expected to result in a \$263,000 increase in investments in housing. Further, the model projects \$326,000 will be generated in additional local tax revenues.

Without intending to criticize or second guess the author of the EIS (the Chesapeake Division of the Naval Facilities Engineering Command) it would appear that the response by the forecast model is more complete than the submission which was approved. This output was obtained with relatively little time investment.

The authors expected that the program would have information pertaining to areas where there are major population concentrations. We were impressed, however, by the completeness of the data that can be extracted on a county by county basis throughout the entire United States. The model provides a standardized basis for measuring the socioeconomic impact of

military projects requiring an EIS. The adoption of a standardized system has the implicit benefit of allowing examination in retrospect for the purpose of fine tuning and maintenance of the model.

Since the most reliable data one can obtain is that which is extracted empirically, the model can be adjusted after the completion of a number of projects and the true results of the environmental intrusion can be measured. If the model used in the preparation of the various EIS's is not the same, there is no basis for a uniform adjustment to be made based on the actual results. Thus, possible future predictions from an improved model will be lost.

SUMMARY AND CONCLUSIONS

The objective of the Construction Engineering Research Laboratory in developing these programs is "to develop systematic procedures that can be used by personnel at all levels of the Army to prepare and review environmental impact assessments and statements for all Army programs."¹ After a careful examination of the EIS submitted by the Chesapeake Division of Naval Facilities Engineering Command for the construction project at the U. S. Naval Academy, the authors believe that the information contained therein could have been obtained in a matter of days using the programs developed at CERL. In truth, CERL's programs provided more information than was used in the EIS that was submitted. In this instance more than a sufficient amount of information was provided for an adequate EIS.

The most impressive aspect of the effort in terms of savings in time and cost was in the gathering of the data. Information that would take weeks and months to research was readily available in these programs. The data must be placed in proper form and written up in an EIS, but the information is provided. Not infrequently are time and cost the major factors in the preparation of an EIS. This is particularly so when projects are halted because of lawsuits challenging federal agencies to prepare full impact statements rather than Negative Declarations or Environmental Impact Assessments. Courts have intervened in over 650 cases in the last seven years requiring that full EISes be prepared. In many cases projects were halted until the agency complied.²

¹Remus, M.D., Col., USA, Environmental Impact Analysis Systems Research at CERL, prepared by Dept. of the Army Construction Engineering Research Laboratory, P.O. Box 4005, Champaign, Illinois 61820.

²Hornblower, Margot "Impact Data: What's Wrong," The Washington Post, February 13, 1977, p. A1, A4.

There is a very significant potential for saving time and costs in that EICS, although it does not clearly indicate whether an EIA or an EIS must be written, does provide an implicit indicator as to the probability of satisfying CEQ's requirement with only an EIA. As noted earlier, an A in the EICS matrix indicates environmental impacts that must be addressed. A high number of A's would indicate the likelihood that an EIS be written.

One problem that is frequently cited in any analysis of the writing of an EIS is that it often becomes a form of bureaucratic justification for decisions that are already made rather than a source of reliable information.² The use of CERL's programs at the earliest planning stage would help integrate environmental information in the decision-making process. This would be far preferable to what is too often the case of tailoring the environmental information to meet the needs of a previously developed plan of action and to get past the hurdle of preparing an EIS.

²Ibid.

RECOMMENDATIONS

It is the author's conclusion that CERL has taken a major step in achieving its objective. We believe that these programs are useful tools for the Navy and should be used by NESO when guiding naval installations in preparing environmental reports. We further believe that appropriate personnel at naval installations should be trained to use these programs on their own. We believe there will be a saving of time and money by using the work already completed by the Army. We recommend the use of these resources be supported by the Chief of Naval Material.

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Unless otherwise noted, all quotes in this report are taken from CERL reports or other literature provided by CERL. All use of CERL programs and data for this project was provided through the courtesy of CERL at no cost to the Navy.